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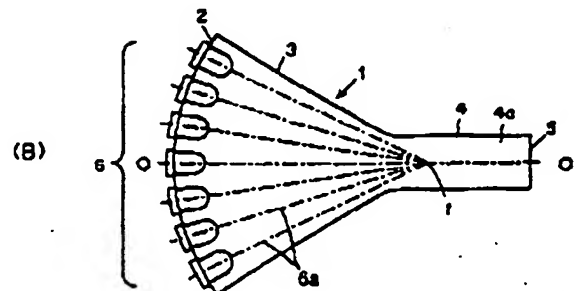
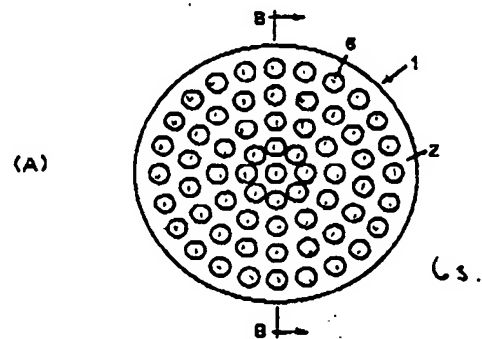
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(54) 【発明の名称】 歯科用光照射器

(57) 【要約】

【目的】 光重合レジン効率よく光重合可能な光源と導光体とする。

【構成】 片側端面が凸状の2次曲面2である、特に、光波長(480±50nm)の光に対し、透明な導光体1の2次曲面2に、発光する光6aが2次曲面2に直角となるように、複数の青色(480±50nm)の発光ダイオード6を取り付け、発光ダイオード6からの光6aを導光体1の点fに集光して、円筒状導光路5から光重合レジン(図示せず)に向け照射する。また、導光体1の2次曲面2側を円錐面3、円筒状導光路5の外周面として反射膜を施し、光利用効率を高める。



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[Structure] One end surface of a light guide 1, that is transparent to a light with a wavelength of  $(480 \pm 50 \text{ } \mu\text{m})$  is a convex quadratic surface 2. A plurality of blue  $(480 \pm 50 \text{ } \mu\text{m})$  light-emitting diodes 6 are installed so that the emitted light 6a becomes perpendicular to the quadratic surface 2. Light 6a emitted from the light-emitting diodes 6 is gathered in point (f) of the light guide, and a photopolymerizable resin (not shown) is illuminated through a cylindrical light channel 5. Furthermore, the side of the quadratic surface 2 of the light guide 1 is coated with a reflecting film as an outer surface of a conical surface 3 and cylindrical light channel 5 for increased light utilization efficiency.

## PAGE 6

[Note: Incomplete paragraph and paragraphs not related to the drawings on this page were not translated.]

### [Brief Description of the Drawings]

Fig 1 illustrates the light illumination device for dentistry in accordance with the present invention.

Fig 2 is an external view used for the explanation of another embodiment of the light guide shown in Fig 1.

Fig 3 illustrates another embodiment of the light illumination device for dentistry in accordance with the present invention.

Fig 4 is a schematic structural diagram illustrating an example of the conventional light illumination device for dentistry.

### [Legends]

1 - light guide; 2 - quadratic surface; 3 - conical surface; 4 - cylindrical surface; 5 - emitting surface; 6 - light-emitting diode; 7 - reflecting film; 10 - case; 11 - outer tube (illegible); 12 - cylindrical member; 13 - battery; 14 - switch; 21 - light source; 22 - elliptical reflecting mirror; 23 - filter; 24 - light guide (optical fiber, quartz, plastic, etc.); 25 - lead wire

Fig 1

Fig 2

Fig 3

Fig 4

## PATENT ABSTRACTS OF JAPAN

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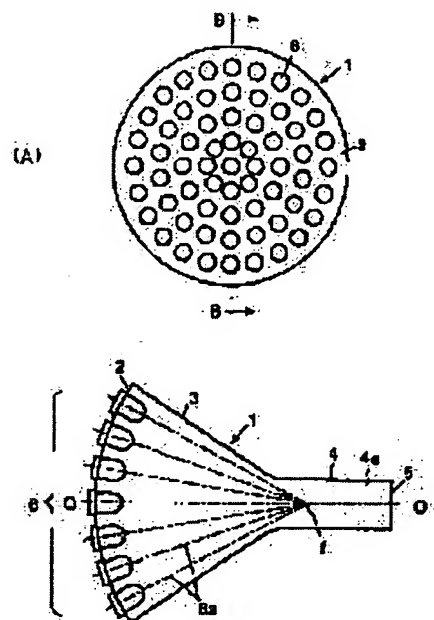
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## (54) DENTAL PHOTOIRRADIATOR

## (57)Abstract:

PURPOSE: To provide a dental photoirradiator consisting of light sources and a light transmission body capable of efficiently forming a photopolymerized resin by photopolymerization.

CONSTITUTION: Plural blue ( $480 \pm 50 \mu\text{m}$ ) light emitting diodes 6 are mounted at the quadratic surface 2 of the light transmission body 1 of which the one side end face is the projecting quadratic curved surface 2 and is transparent to light of a light wavelength ( $480 \pm 50 \mu\text{m}$ ) in particular in such a manner that emitted light rays 6a are perpendicular to the quadratic curved surface 2. The light rays 6a from the light emitting diodes 6 are condensed to the point (f) of the light transmission body 1 and the photopolymerizing resin is irradiated with the condensed light from a cylindrical waveguide 5. The quadratic curved surface 2 side of the light transmission body 1 is formed as a conical surface 3 and a reflection film is formed as the outer peripheral surface of the cylindrical waveguide 5 to enhance the light utilization efficiency.



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**CLAIMS**

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[Claim(s)]

[Claim 1] In the optical irradiation machine for dentistry which photopolymerizes photopolymerization resin by the irradiation light from a transparent material. The transparent material whose other end side is an outgoing-radiation side from a light guide line on convex secondary curved surface from which a single-sided end face turns into a photogenesis side, It is attached all over the aforementioned secondary curved surface, and consists of two or more light emitting diodes which carry out the outgoing radiation of the blue glow in the right-angled orientation of this secondary curved surface. The optical irradiation machine for dentistry characterized by condensing the blue glow which carries out an outgoing radiation from this light emitting diode within the aforementioned transparent material, and irradiating towards the aforementioned photopolymerization resin from the aforementioned outgoing-radiation side through the aforementioned light guide line.

[Claim 2] The number of the aforementioned light emitting diodes with which the photogenesis wavelength of the aforementioned light emitting diode is attached in the aforementioned secondary curved surface by 480\*\*50nm is an optical irradiation machine for dentistry according to claim 1 characterized by being the number with which the power density of the light which carries out condensing irradiation becomes beyond a predetermined value.

[Claim 3] It is the optical irradiation machine for dentistry according to claim 1 or 2 characterized by for the aforementioned transparent material consisting of a transparent material to a blue glow with a wavelength of 480\*\*50nm, for the aforementioned secondary curved-surface side being a conical surface, and for the aforementioned light guide line side of the periphery side configuration of this transparent material being a cylinder side, and wearing this conical surface and the cylinder side by the reflective layer.

[Claim 4] The optical irradiation machine for dentistry according to claim 3 characterized by for the aforementioned outgoing-radiation side side having put the pallium spool which is the circular cylinder member of a translucency, and enabling disinfection of this pallium spool and sterilization on the outside outside of the aforementioned cylinder side of the aforementioned transparent material.

[Claim 5] The optical irradiation machine for dentistry given in the claim 1 or four term characterized by including the aforementioned light emitting diode in the aforementioned transparent material, building in a cell, being cordless and driving the aforementioned light emitting diode either.

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[Translation done.]

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention relates to the optical irradiation machine for dentistry for making a detail harden more the photopolymerization resin used as restorative dental materials after prosthesis formation or the odontogenesis in a prosthesis manipulation or an odontotherapy about the optical irradiation machine for dentistry.

[0002]

[Description of the Prior Art] The color tone in which photopolymerization resin matched the color tone of a tooth is acquired easily, and since restoration work is easy, many photopolymerization resin is used as a charge of the restorative dental materials after a prosthesis manipulation or the odontogenesis. When using photopolymerization resin as restorative dental materials of a tooth, after pasting it up on the breakage of a tooth, light is irradiated, and is stiffened, cutting, polishing, etc. are performed after hardening, it is made to unite with the original tooth, and aesthetics is given and the tooth before a crash is restored.

[0003] Drawing 4 is an outline block diagram for explaining an example of the conventional optical irradiation machine for dentistry, and for the light source and 22, as for a VCF and 24, an ellipse reflective mirror and 23 are [ 21 / transparent materials (an optical fiber, a quartz, plastics, etc.) and 25 ] lead wire among drawing, and as everyone knows, the light source 21 is in the focal position of the ellipse reflective mirror 22, and reflects the light from this light source 21 by the ellipse reflective mirror 22. This reflected light is introduced in the transparent material 24 in which the light-receiving edge was arranged near the focal position of another side which makes the focus of the aforementioned ellipse reflective mirror, and a pair, is transmitted through this transparent material 24, and is irradiated by photopolymerization resin as mentioned above. In addition, VCF 23 makes only the light of a light wave length component required for photopolymerization among the light from the light source 21 penetrate, and passes only the light of a 478nm wavelength component.

[0004]

[Problem(s) to be Solved by the Invention] Photopolymerization resin is hardened by irradiation of light, and by optical irradiation of predetermined wavelength, the polymer which has a uniform conversion in the whole is obtained, and it is hardened to predetermined hardness. In order to harden photopolymerization resin to a predetermined degree of hardness, it becomes conditions that the illuminance and wavelength of light to irradiate are stable. Moreover, since the amount of irradiation luminous energies affects the setting time and the depth of hardening, the light source by which an illuminance, wavelength, energy, etc. were stabilized is required for it with the optical irradiation vessel for dentistry.

[0005] The light in which it has a heating filament and the conventional optical irradiation machine for dentistry shown in drawing 4 emitted light as light source since incandescent lamps, such as a halogen lamp, were used VCF 23 is needed in order to irradiate the light of the wavelength to which photopolymerization resin was suitable for carrying out a polymerization since the domain of the size of

light wave length contained was wide. As power for optical irradiation, the light intercepted with VCF 23 is the reactive component of photopolymerization, and also has the optical loss for for this reason, optical luminous efficacy being bad and being further reflected by the ellipse reflective mirror 22 etc., it became large power, and it is impossible to make it cordless and the constraint on operation was received.

[0006] this invention aims at offering the optical irradiation machine for dentistry which made the optical loss the minimum, condensed using the light emitting diode light source of the masses which current-to-light-transference luminous efficacy is excellent in, and emit light in a blue glow effective in photopolymerization, was stabilized, enabled irradiation of the light of the optimum wavelength for photopolymerization of photopolymerization resin, and was excellent in operability.

[0007]

[Means for Solving the Problem] In the optical irradiation machine for dentistry which photopolymerizes photopolymerization resin by the irradiation light from (1) transparent material in order that this invention may solve the above-mentioned technical problem The transparent transparent material whose other end side is an outgoing-radiation side from a light guide line on convex secondary curved surface from which a single-sided end face turns into a photogenesis side, It is attached all over the aforementioned secondary curved surface, and consists of two or more light emitting diodes which carry out the outgoing radiation of the blue glow in the right-angled orientation of this secondary curved surface. condensing the blue glow which carries out an outgoing radiation from this light emitting diode within the aforementioned transparent material, and irradiating towards the aforementioned photopolymerization resin from the aforementioned outgoing-radiation side through the aforementioned light guide line -- further (2) in the above (1), the number of the aforementioned light emitting diodes with which the photogenesis wavelength of the aforementioned light emitting diode is attached in the aforementioned secondary curved surface by  $480 \times 50 \text{ nm}$  it is the number with which the power density of the light which carries out condensing irradiation becomes beyond a predetermined value -- further (3) In the above (1), the aforementioned transparent material consists of a transparent material to a blue glow with a wavelength of  $480 \times 50 \text{ nm}$ . the periphery side configuration of this transparent material in a conical surface, the aforementioned secondary curved-surface side is [ the aforementioned light guide line side ] a cylinder side, and this conical surface and the cylinder side are being worn by the reflective layer -- further (4) -- having put the pallium spool whose aforementioned outgoing-radiation side side is the circular cylinder member of a translucency on the outside of the aforementioned cylinder side of the aforementioned transparent material, and having enabled disinfection of this pallium spool and sterilization in the above (3), -- further (5) In the above (1) or either of (4), the aforementioned light emitting diode is included in the aforementioned transparent material, a cell is built in, and it is characterized by being cordless and driving the aforementioned light emitting diode.

[0008]

[Function] On convex secondary curved surface from which one end face turns into a photogenesis side, a number of two or more light emitting diodes with which blue photogenesis is carried out in a field and the right-angled orientation, and optical predetermined power density is obtained to this whole secondary curved-surface surface by transparent secondary curved surface of a transparent material whose other end side is an outgoing-radiation side of a light guide line are attached, it condenses to one in a transparent material, and the light which condensed is irradiated towards photopolymerization resin through the outgoing-radiation side of a light guide line. It considers as the efficient optical irradiation machine for dentistry by emitting light in the  $480 \times 50$ -micrometer blue glow which was suitable for photopolymerization in light emitting diode, using a VCF as unnecessary.

[0009]

[Example]

[Example 1] (it corresponds to claims 1 and 2)

Drawing 1 is drawing for explaining the optical irradiation machine for dentistry by this invention, drawing 1 (A) is front view, drawing 1 (B) is a view B-B line cross section of drawing 1 (A), and, for secondary curved surface and 3, as for the cylinder side of light guide line 4a, and 5, a conical surface



and 4 are [ one / a transparent material and 2 / an outgoing-radiation side and 6 ] light emitting diodes among drawing. In addition, in order to avoid \*\*\*\*, in the two or less-drawing drawing, the same reference number as the case of drawing 1 is given to the fraction which carries out the same operation as drawing 1. The side face of an end is the secondary curved surfaces 2, such as the sphere and ellipse which were surrounded by the conical surface 3, a hyperboloid, and a paraboloid, the side face of the other end is the outgoing-radiation side 5 surrounded in respect of [ 4 ] the cylinder of light guide line 4a which followed the aforementioned conical surface 3, and the transparent material 1 is constituted by transparent glass or a transparent resin material at one.

[0010] Two or more light emitting diodes 6 are attached in the whole surface at the secondary curved surface 2 of a transparent material 1 covering field homogeneity. The installation posture of the light emitting diode 6 at this time is set that blue-glow 6a which emits light becomes right-angled to the field of the secondary curved surface 2. Consequently, the blue glow from light emitting diode 6 condenses to f on medial-axis O-O of a transparent material 1, an outgoing radiation is carried out from the outgoing-radiation side 5 through light guide line 4a, the power density of irradiation light is required for photopolymerization, for example, the number of light emitting diodes 6 is set to become two or more [ 1000W //m ]. The blue glow of light emitting diode 6 has the optimum blue light emitting diode which emits light in a blue glow with an optimum wavelength [ for the polymerization of photopolymerization resin ] of 480\*\*50nm. As for the transparent material 1 at this time, the material with the most sufficient permeability is applied to a blue glow with a wavelength of 480\*\*50 micrometers.

[0011] According to the optical irradiation machine for dentistry shown in the above-mentioned drawing 1, the light emitting diode 6 which was excellent in the photoelectric conversion efficiency Since it is attached in the secondary curved surface 2 of a transparent material 1, it condenses to f in a transparent material 1 and it irradiates towards photopolymerization resin through light guide line 4a It is efficient, a small power drive is attained, and photopolymerization stabilized have [ no special VCF ] most efficiently becomes possible by considering as the light emitting diode whose wavelength of a blue glow is 480\*\*50nm further.

[0012] [Example 2] (it corresponds to a claim 3)

Drawing 2 is an external view for explaining other examples of a transparent material shown in drawing 1, and seven are a reflective layer among drawing. The reflective layer 7 which becomes the fraction of a conical surface 3 and the cylinder side 4 from a metal or dielectrics, such as aluminum (aluminum), Ag (silver), and Au(gold), is given to the transparent material 1 shown in drawing 2, it prevents the blue glow which emitted light by light emitting diode 6 acting outside as Idemitsu through a conical surface 3 and the cylinder side 4 from a transparent material 1 to it, and the condensing luminous efficacy of a blue glow is raised to it.

[0013] [Example 3] (it corresponds to claims 4 and 5)

Drawing 3 is the example of further others of the optical irradiation machine for dentistry by this invention, and, for a case and 11, as for a circular cylinder member and 13, a pallium spool and 12 are [ ten / a cell and 14 ] switches among drawing. The optical irradiation machine for dentistry shown in drawing 3 incorporates the optical irradiation machine for dentistry which attached the light emitting diode 6 of blue photogenesis in the secondary curved surface 2 of the transparent material 1 which gave the reflective layer 7 shown in drawing 2 in outside \*\* 10 with the cells 13, such as the primary rechargeable battery. It is what was made into the carrying freedom, and outside \*\* 10 consists of irradiation machine stowage 10a which contains a transparent material 1, and the grasping section 10b of the configuration which incorporates a cell 13 and can be grasped. to grasping section 10b A switch 14 is formed, and it can open and close, grasping between a cell 13 and the light emitting diodes 6, and the cordless optical irradiation machine for dentistry is constituted. In addition, if the plating layer equivalent to the reflective layer 7 etc. is given to the internal surface of parietal bone of irradiation machine stowage 10a even when the reflective layer 7 is not given, as the light pipe 1 included in irradiation machine stowage 10a is shown in drawing 1, the same effect will be acquired as the reflective layer 7 was given.

[0014] Since optical luminous efficacy will fall if the open air is touched, the particle which floats in the

air adheres and \*\*\*\*\* and a particle adhere, the outgoing-radiation side 5 of a transparent material 1 needs to protect this. For this reason, the outgoing-radiation side 5 of a transparent material 1 is projected from irradiation machine stowage 10a, and the pallium spool 11 is put on the outside of the projected cylinder side 4. The circular cylinder member 12 with a translucency is formed in the end face by the side of the outgoing-radiation side 5 of the pallium spool 11, and it has become removable, and disinfection of the pallium spool 11, sterilization (elevated-temperature wet sterilization), etc. are enabled, and contamination is prevented.

[0015]

[Effect of the Invention] According to this invention, there is an effect shown below so that clearly from the above explanation.

Since the effect: end side corresponding to a claim 1 attaches in secondary curved surface the light emitting diode with the sufficient current-to-light-transference luminous efficacy which emits light in a right-angled blue glow, condenses to one in a transparent material and was made to irradiate the transparent transparent material which is convex secondary curved surface towards photopolymerization resin from the other end side, photopolymerization becomes it is efficient and possible.

In addition to the effect of the effect: claim 1 corresponding to a claim 2, since irradiation light is the predetermined power density (2 or more [ for example, / 1000W //m ]) in the optimum light wave length (480\*\*50 micrometers) for the polymerization of photopolymerization resin, it can perform optical use have / no special VCF / still efficiently.

Since the reflective layer was formed as the conical surface and cylinder side where the appearance of the outgoing-radiation side of secondary curved-surface side of an end and the other end continued with the transparent material to the blue glow whose material of an effect: transparent material corresponding to a claim 3 is the wavelength of 480\*\*50nm, it is the light guide line of the minimum configuration which condenses two or more light emitting diodes, and optical use can be performed most efficiently at the minimum [ loss / optical ].

Since the pallium spool with which the outgoing-radiation side side prepared the transparent circular cylinder member in the outside of the cylinder side of a transparent material used as the light guide line of the blue glow corresponding to a claim 4 of which effect: condensing was done was put removable, the outgoing-radiation side side which is easy to become dirty is kept always purely and clean, is stabilized over a long period of time, and can be used.

Since the transparent material and cell which attached the effect: blue light emitting diode corresponding to a claim 5 were incorporated in one case and it is cordless, the work effect improves.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is drawing for explaining the optical irradiation machine for dentistry by this invention.

[Drawing 2] It is an external view for explaining other examples of a transparent material shown in drawing 1.

[Drawing 3] It is the example of further others of the optical irradiation machine for dentistry by this invention.

[Drawing 4] It is an outline block diagram for explaining an example of the conventional optical irradiation machine for dentistry.

[Description of Notations]

1 -- transparent material, 2 -- secondary curved surface, and 3 -- a conical surface, 4 -- cylinder side, 5 -- outgoing-radiation side, and 6 -- light emitting diode, 7 -- reflective layer, 10 -- case, and 11 -- a palladium spool, 12 -- circular cylinder member, 13 -- cell, and 14 -- a switch, 21 -- light source, 22 -- ellipse reflective mirror, and 23 -- a VCF, 24 -- transparent materials (an optical fiber, a quartz, plastics, etc.), and 25

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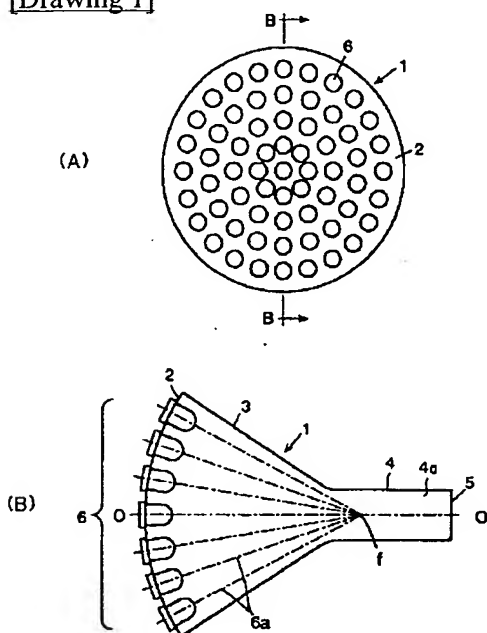
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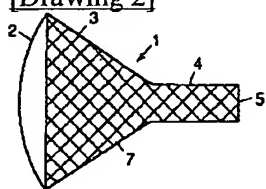
**DRAWINGS**

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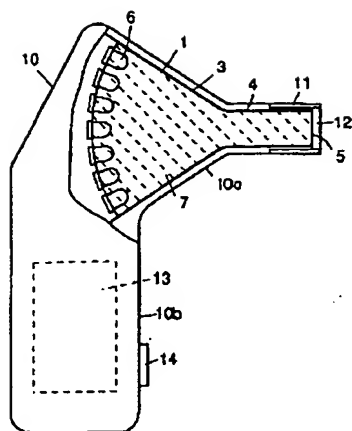
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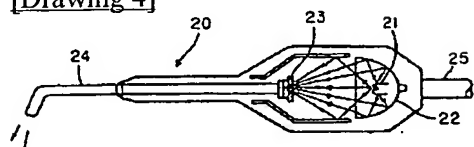
**[Drawing 2]**



**[Drawing 3]**



[Drawing 4]



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